

APPLICATION OF PROPICONAZOLE AND *PSEUDOMONAS CICHORII* FOR CONTROL OF OAK WILT IN TEXAS LIVE OAKS, 1985-1992: The efficacy of two formulations of propiconazole, Banner and Tilt, and biocontrol agent (*Pseudomonas cichorii*) for control of oak wilt was tested in a natural mature stand of live oaks at a location near Yoakum, Texas with a predominantly sandy soil type. The field plots, established 15 March 85, consisted of five randomly selected plot locations each with 75 trees, further subdivided into 5 subplots each with 15 trees, for a total of 375 trees. Treatments were applied in a completely randomized design within each subplot, each containing 5 replications per treatment, for a total of 125 trees per treatment. Treatments included bole injections with 50 ml of  $1 \times 10^7$  CFU/ml of *P. cichorii* in potato dextrose broth diluted in 1 liter of water, control (no treatment), and applications of propiconazole either to the soil or injected. The 125 fungicide-treated trees were divided into 5 groups of 25 replicate trees each receiving one of the following propiconazole treatments: 1) Tilt 24 ml in soil, 2) Tilt 24 ml injected, 3) Banner 75 ml in soil, 4) Banner 75 ml injected, and 5) Banner 150 ml injected. All fungicide treatments were applied in 1 L of water total volume per tree. Soil treatments of propiconazole were distributed evenly around the dripline of the tree in small holes dug at 3-5 m intervals, depending on crown size, and covered with soil. Injections utilized a portable CO<sub>2</sub> pressurized sprayer at 15 psi connected with tygon tubing to injection ports. Treatments were applied for two consecutive years (1985 and 1986) prior to inoculation in 1987, and continued once annually through 1990 (six total successive years). Inoculum was prepared from colonies of *Ceratocystis fagacearum* after two weeks growth on potato dextrose agar from four 90 × 15 mm petri plates mixed in a blender with 2500 ml of water. Inoculum was applied in 15 ml aliquots of the mixed mycelial-conidial suspension to a slit cut into the sapwood on two sides of each tree. Crown density ratings were recorded once each year for seven years post-treatment using the following rating scale: 1 = dead tree, 2 = thin crown, 3 = medium crown, and 4 = full crown, healthy tree.

Oak wilt symptoms, characterized by veinal necrosis and thinning of the crown associated with defoliation, did not appear until the second year after inoculation. Treatment effects on crown density were highly significant ( $P < 0.001$ ) during the rating period of 1987-92. Crown density ratings of inoculated control trees that received no preinoculation fungicide or bacteria treatments declined steadily during the observation period as symptoms developed. Trees receiving bacterial antagonist *P. cichorii* showed a similar decline and provided no significant protection against *C. fagacearum* infection or long-term control of oak wilt. However, all five propiconazole treatments provided significantly higher crown density ratings than bacteria or control treatments, but there were no significant differences among individual propiconazole treatments, indicating that the lower rates were equally effective. Crown density only decreased slightly with each fungicide treatment. No phytotoxicity was observed with any treatment. The results indicate that propiconazole provides significant long-term protection to live oaks against the oak wilt pathogen when applied on sandy sites for several consecutive years.

Treatment and rate ml/L (g A.I./ tree)*	n	Mean Crown Rating <sup>†</sup>			
		Years post-treatment and inoculation with <i>C. fagacearum</i>			
		1	2	3	4
Banner 1.3 EC, soil 75 ml (11.7 a.i.) . . . . .	25	3.9 a	3.9 a	3.8 a	3.7 a
Banner 1.3 EC, injected 75 ml (11.7 a.i.) . . . . .	25	3.9 a	3.8 a	3.8 a	3.7 a
Banner 1.3 EC, injected 150 ml (23.4 a.i.) . . . . .	25	3.9 a	3.8 a	3.8 a	3.5 a
Tilt 3.6 EC, soil 24 ml (10.4 a.i.) . . . . .	25	4.0 a	4.0 a	3.9 a	3.6 a
Tilt 3.6 EC, injected 24 ml (10.4 a.i.) . . . . .	25	3.7 a	3.6 a	3.4 a	3.4 a
<i>P. cichorii</i> $1 \times 10^7$ CFU/ml (50 ml) . . . . .	125	3.1 b	2.7 b	2.5 b	2.5 b
Control . . . . .	125	3.2 b	3.8 a	2.5 b	2.5 b

\* CFU = Colony forming units.

\*\* Crown density rating scale: 1 = dead tree, 2 = thin crown, 3 = medium crown, and 4 = full crown, healthy tree. Means in each column followed by the same letter are not significantly different according to protected LSD tests ( $P = 0.05$ ).